# Boreal Toad
# Species Conservation Assessment Update

**Title of Assessment: Boreal Toad (*Bufo boreas boreas*): A Technical Conservation Assessment, USDA Forest Service, Rocky Mountain Region**

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**Update Summary:** The Southern Rocky Mountain (SRM) population of boreal toads was withdrawn from listing consideration under the Endangered Species Act (ESA) in September of 2005 (source 1). The USFWS delisted the SRM population because it did not meet the ESA definition of a distinct population segment. The boreal toad is still classified as state endangered in Colorado and New Mexico and as a native species of special concern in Wyoming. USFS Region 2 continues to classify the boreal toad as a sensitive species. If future genetic studies can effectively demonstrate that the SRM population of boreal toads is a distinct population segment than there is the potential for listing under the ESA again.

The status of Colorado's breeding sites was updated in 2005 and 2006 with an ongoing monitoring effort (source 2). According to the Boreal Toad Recovery Team, there are currently 71 breeding localities comprising 38 separate populations in Colorado and southern Wyoming. Only two of the 38 populations in Colorado are considered viable under the Boreal Toad Recovery Teams criteria. Survey work for this species in 2005 and 2006 resulted in eight new breeding sites found in Colorado within the species range. The threat of disease, especially infection from the chytrid fungus (*Batrachochytrium dendrobatidis*) remains high to many populations of boreal toads.

New Mexico Game and Fish is working on a draft recovery plan for the boreal toad with a goal to hopefully establish viable populations through repatriation (source 3). There has not been a confirmed boreal toad observation in New Mexico since the 1986.

There have been several new studies since the original publication on disease, movement, and population ecology (sources 4 – 9) that are important in aiding with management and conservation of the boreal toad.

**Distribution: New Information**
**References: New References**
**Taxonomic Status: Unchanged**
**Agency Status: Change in Federal Status**
**Other: See below**

**Significance of Changes Relative to Original Assessment:** With the exception of the removal from ESA listing consideration, the new information available for *Bufo boreas boreas* does not require significant changes to the original assessment published in 2005. As new information becomes available from ongoing studies on the chytrid fungus (*Batrachochytrium dendrobatidis*) future updates should be considered to give researchers and agencies a better understanding of this threat to boreal toads and its management implications.

# Positive Findings of New or Updated Information and Their Sources

(Note: The Table A checklist attached to this update provides a summary of all sources consulted)

## Source 1

U.S. Fish and Wildlife Service. 2005. Endangered and Threatened Wildlife and Plants; Revised 12-month finding for the Southern Rocky Mountain Distinct Population Segment of the Boreal Toad (*Bufo boreas boreas*). Federal Register 70(188): 56880-56881.

***Summary of New Information***

The Southern Rocky Mountain (SRM) population of boreal toads was withdrawn from listing consideration under the Endangered Species Act in September of 2005 due to the USFWS decision that the SRM population did not meet the ESA definition of a species, subspecies or distinct population segment.

The USFWS will continue to seek information on the taxonomy, biology, ecology and threats to the boreal toad.

***Relevant Sections of the Conservation Assessment Affected by the Updates***

Introduction and Management Status

## Source 2

Boreal Toad Recovery Team. 2006. Report on the status and conservation of the boreal toad (*Bufo boreas boreas*) in the Southern Rocky Mountains: 2005. Colorado Division of Wildlife, Denver, CO.

***Summary of New Information***

Based on the definition of "breeding population" used by the Boreal Toad Recovery Team (BTRT), there are currently 71 breeding localities comprising 38 separate populations in Colorado and southern Wyoming. Only two of the 38 populations are considered viable under the criteria established by the BTRT. The two viable populations are the Cottonwood Creek population in Chaffee County, CO. and the Triangle Pass population in Gunnison County, CO.

Monitoring of all the Colorado breeding sites and one site in Wyoming continued in 2005. The status report contains all the updated data for each site.

Additional testing for chytrid fungus continued in 2005. There are now 16 known breeding sites in Colorado that have tested positive for chytrid fungus.

Eight new breeding sites have been found in Colorado since the publication of the technical conservation assessment: Muddy Pass (Jackson County), Trout Creek, Panhandle Creek, and Ypsilon Lake (Larimer County), Big Meadow (Grand County), Rough and Tumbling Creek (Park County), Lincoln Creek (Pitkin County), and Upper Taylor River (Gunnison County).

***Research Updates Summarized in Report***

1) Brad Lambert, Colorado Natural Heritage Program
   Chaffee County Mark-Recapture Study 2005

Since 1998, a mark-recapture study was conducted in the Cottonwood Creek drainage in Chaffee County, CO. A total of 978 adult males and 297 females have been pit-tagged in an effort to collect data on population estimates, survival and movement. Preliminary analyses of the data suggest a high degree of breeding site fidelity with some rare movement between sites within a large metapopulation. One adult male moved approximately 8 km in a span of three years.

2) Kevin Rogers and Carrie Slubowski, Colorado Division of Wildlife
   Repatriation of boreal toads *Bufo boreas* on the Grand Mesa, Colorado.

The effort to establish a new population of boreal toads on the Grand Mesa, Mesa County, CO. continued in 2005 with the release of 12 thousand tadpoles and 900 metamorphs at a site in the Kannah Creek drainage. Sub-adult toads were found from previous releases in 2003 and 2004.

3) Lauren Livo, University of Colorad
Status of *Batrachochytrium dendrobaditis* infection and survival of boreal toads in the Urad Valley, 2005.

In 2004 and 2005 boreal toads were radio tracked in the chytrid positive Urad Valley, Clear Creek County, CO. Several key observations were made during this study: (1) A seasonal peak of infection in June for both years was observed. (2) Toads that were infected in 2004 apparently cleared the infection late in the activity season, survived overwintering and reappeared at the breeding sites in 2005. (3) Male toads are capable of fertilizing more than one egg mass per season.

4) Lauren Livo, University of Colorado
Laboratory exposure trials of boreal toads to *Batrachochytrium dendrobaditis*

Tests were conducted to examine whether prior exposure of boreal toad populations to chytrid fungus influenced survival of toadlets after exposure to the fungus. The results suggested that two populations (Urad Valley, Clear Creek County, CO. and Buck Mountain, Routt County, CO.) may have developed some resistance.

***Relevant Sections of the Conservation Assessment Affected by the Updates***

Management Status, Biology and Ecology, Threats, and Management of Boreal Toads in Region 2

## Source 3

Pierce, L. J. S. 2006. Boreal toad (*Bufo boreas boreas*) recovery plan (draft). New Mexico Department of Game and Fish, Santa Fe, NM.

***Summary of New Information***

A recovery plan draft was developed by the New Mexico Game and Fish for the boreal toad in New Mexico. The plan addresses the following objective parameters: All populations within the state are identified, suitable habitat for repatriation is identified, management and threats are assessed and secure populations are established and maintained.

***Relevant Sections of the Conservation Assessment Affected by the Updates***

Management status and management of boreal toads in Region 2.

## Source 4

Scherer, R. D., E. Muths, B. R. Noon, and P.S. Corn. 2005. An evaluation of weather and disease as causes of decline in two populations of boreal toads. Ecological Applications 15(6): 2150-2160.

***Summary of New Information***

Two boreal toad sites in Rocky Mountain National Park, CO experienced severe declines in abundance since the late 1990's. These sites are positive for the chytrid fungus. Mathematical models were developed to evaluate weather and disease as causes of the decline. Analysis provided strong support for the hypothesis of an introduced fungus and little support for weather as the reason for the decline in these two populations.

***Relevant Sections of the Conservation Assessment Affected by the Updates***

Threats and Management of boreal toads in Region 2

## Source 5

Goates, M. C. 2006. The dogma of the 30 meter riparian buffer: the case of the boreal toad (*Bufo boreas boreas*). M.S. Thesis, Brigham Young University, Provo, UT. 48 pp.

***Summary of New Information***

A radio telemetry study was conducted on boreal toads in south-central Utah to investigate the adequacy of 30 m riparian buffers. The study found that boreal toads utilize upland habitat in late summer often more than 100 m from water and that females move greater distances from water than males. The results suggested that a 30 m buffer along the riparian area was inadequate for protecting boreal toads.

***Relevant Sections of the Conservation Assessment Affected by the Updates***

Activity and movement, population and habitat management

## Source 6

Adams, S. B., D. A. Schmetterling, and M. K. Young. 2005. Instream movements by boreal toads (*Bufo boreas boreas*). Herpetological Review 36(1): 27-33.

***Summary of New Information***

This study involved using hoop nets along three streams in Montana as a method of gathering mark-recapture and movement data for boreal toads. They made 252 captures and found that boreal toads made extensive movements in streams. Toads were caught both up- and downstream with downstream captures being the most common. The longest movement was 1.5 km in 6 days. This is the first study to examine movements within streams and demonstrated the effectiveness of hoop nets as a sampling method. The study also suggests that stream movements may be an important component within the home range activity of a boreal toad.

***Relevant Sections of the Conservation Assessment Affected by the Updates***

Activity and movement, management of boreal toads in Region 2.

## Source 7

Muths, E., R. D. Scherer, P. S. Corn, and B. A. Lambert. 2006. Estimation of temporary emigration in male toads. Ecology 87(4): 1048-1056.

***Summary of New Information***

Using mark-recapture data from three breeding sites in Colorado, emigration from breeding sites by male toads was estimated. The data suggests that not all male toads return to the breeding site every year. The probability of temporary emigration ranged from 10% to 29% at these sites.

***Relevant Sections of the Conservation Assessment Affected by the Updates***

Activity and movement, breeding biology, population demography.

## Source 8

Carey, C., J. E. Bruzgul, L. J. Livo, M. L. Walling, K. A. Kuehl, B. F. Dixon, A. P. Pessier, R. A. Alford, and K. B. Rogers. 2006. Experimental exposure of boreal toads (*Bufo boreas*) to a pathogenic chytrid fungus (*Batrachochytrium dendrobatidis*). EcoHealth 3: 5-21.

***Summary of New Information***

This study documents the interactions between the fungus *Bactrachochytrium dendrobatidis* (Bd) and the boreal toad host. The main findings from this study are: (1) chytridmiomycosis can be experimentally induced in boreal toadlets; (2) dosage and the duration of exposure play a significant role in the length of survival; (3) the model used predicts that the level of infection must reach a threshold to cause death; (4) larger toadlets live longer than smaller toadlets when given

a particular dosage; (5) different housing temperatures and no effect on the length of survival for exposed toads; (6) lethal chytridiomycosis can be transmitted through the water in which infected toads have been sitting.

***Relevant Sections of the Conservation Assessment Affected by the Updates***

Threats, management of boreal toads in Region 2.

## Source 9

Lambert, B. A. and C. Gaughan. 2005. Colorado Natural Heritage Program boreal toad survey and monitoring project 2005. Unpublished report to the Colorado Division of Wildlife, Denver, CO. 49 pp.

***Summary of New Information***

This report details the monitoring of 24 breeding sites in six counties in Colorado, survey results for new boreal toad populations and the results of a mark-recapture study.

The results for the individual breeding site monitoring and the mark-recapture study are the same as the data reported in the Report on the status and conservation of the boreal toad (*Bufo boreas boreas*) in the Southern Rocky Mountains: 2005 (See source 2).

In 2005, the Colorado Natural Heritage Program (CNHP) surveyed 108 sites in seven counties in Colorado for boreal toads. Toads were found at three new sites: one adult male was found in Grand County along the Williams Fork River, two adults were found in Chaffee County along the Salt Creek Trail, and five adults were found in Pitkin County along Snowmass Creek.

***Relevant Sections of the Conservation Assessment Affected by the Updates***

Range, distribution and distribution trends.

## Sources of Additional Information

## Additional Unabstracted Sources – *pre*-Assessment

**(citations pre-dating Assessment publication that were not referenced in it)**


Bartelt, P. E., C. R. Peterson, and R. W. Klaver. 2004. Sexual differences in the post-breeding movements and habitats selected by western toads (*Bufo boreas*) in southeastern Idaho. Herpetlogica 60(4): 455-467.

Holland, A. A. 2002. Evaluating boreal toad (*Bufo boreas*) breeding habitat suitability. M. S. Thesis, Colorado State University, Fort Collins, CO. 68 pp.

Little, E. E., R. D. Calfee, D. L. Fabacher, C. Carey, V. S. Blazer, and E. M. Middleton. 2003. Effects of ultraviolet radiation on toad early life stages. Environmental Science and Pollution Research International 10(3): 167-172

Livo, L. J. and B. A. Lambert. 2001. Life history notes: Boreal toad (*Bufo boreas*). Phoretic host. Herpetological Review 32: 179.

Muths, E., P. S. Corn, A. P. Pessier, and D. E. Green. 2003. Evidence for disease-related amphibian decline in Colorado. Biological Conservation 110: 357-365.

Muths, E. 2003. Home range and movements of boreal toads in undisturbed habitat. Copeia 1: 160-165.


## Additional Unabstracted Sources – *post*-Assessment

**(citations post-dating Assessment publication that refer to the target genus but were determined by the reviewer to contain no information requiring an update of the original assessment)**

Carey, C., P. S. Corn, M. S. Jones, L. J. Livo, E. Muths, and C.W. Painter. 2005. Factors limiting the recovery of boreal toads (*Bufo b. boreas*). *In:* M. J. Lannoo, editor. Amphibian Declines the Conservation Status of United States Species, University of California Press.

Goebel, A. M. 2005. Conservation Systematics: The *Bufo boreas* Species Group. *In:* M. J. Lannoo, editor. Amphibian Declines the Conservation Status of United States Species, University of California Press.

Hossack, B. R., S. A. Diamond, and P. S. Corn. 2006. Distribution of boreal toad populations in relation to estimated UV-B dose in Glacier National Park, Montana, USA. Canadian Journal of Zoology 84: 98-107.

Muths, E. and P. Nanjappa. 2005. Species Accounts: *Bufo boreas*, Western Toad. *In:* M. J. Lannoo, editor. Amphibian Declines the Conservation Status of United States Species, University of California Press.

# Checklist of Sources Consulted for Updates to the Boreal Toad Conservation Assessment

## Guidelines for Producing Updates

Sources of information relevant to review of this Technical Conservation Assessment for updates include databases, experts, personal communications, published and unpublished literature. Positive results are discussed in detail in the Summary of Addendum to the Technical Conservation Assessment.

Internet Literature Searches: The minimal search for each update consists of Google Scholar, Federal Register, plus a minimum of three other available online literature databases. Search terms include at a minimum: species common name, genus, and recent synonyms. Other keywords will be used at the discretion of the reviewer (e.g., passerine, wetland, rodent). Searches will be constrained to the time beginning two years prior to publication of the Technical Conservation Assessment to the present.

Two attempts were made to contact experts and agency personnel.

**Table A.** Sources of information consulted for updates to the Species Conservation Assessment.

| Source Category | Source/ Name | Date | Results |
|---|---|---|---|
| Announcement from R2 to all FS personnel (including species list) | | | No announcement was made |
| Internet based literature databases | Google | 8/17/2006 | Three new sources found using search terms: Bufo boreas, Boreal toad. One new source – see reference 3. Other two sources are included in unabstracted references |
| | Google Scholar | 8/17/2006 | Four new sources found using search terms: Bufo boreas, Boreal toad. One new source – see reference 6, one new source – see reference 4, one new source – see reference 8. One source included in unabstracted reference. |
| | Google Book Search | 8/17/2006 | One new source found using search terms: Bufo boreas, Boreal toad – included in unabstracted references. |
| | Federal Register | 8/17/2006 | One new source (search terms:Bufo boreas, boreal toad)- see reference 1. |
| | CSU Library Catalog | 8/17/2006 | No new sources for search terms: Bufo boreas, Boreal toad. |
| | Prospector (searches multiple university libraries in Colorado) | 8/17/2006 | No new sources for search term: Bufo boreas, Boreal toad. |
| | Web of Science | 8/17/2006 | No new sources for search terms: Bufo boreas, Boreal toad. |
| | Biological Abstracts | 8/17/2006 | One new source (search terms: Bufo boreas, Boreal toad – included in unabstracted references. |
| | WorldCat Dissertations and Theses Database | 8/17/2006 | Two new sources using search terms: Bufo boreas, boreal toad. One new source – see reference 5. One new source included in unabstracted references. |

| Source Category | Source/ Name | Date | Results |
|---|---|---|---|
| NatureServe affiliate program databases and personnel | Brad Lambert | 8/17/2006 | New information- see reference 9 |
| State Agency Personnel | Tina Jackson and Bill Turner | 8/17/2006 | No new information |
| | Kevin Rogers | 8/17/2006 | No new information |
| Federal Agency Personnel | Erin Muths | 8/18/2006 | No new information |
| Primary experts | Lauren Livo | 8/17/2006 | No new information |
| Internal USFS Intranet search | | | Not searched. |
| Original Author | Doug Keinath | 8/17/2006 | No new information |